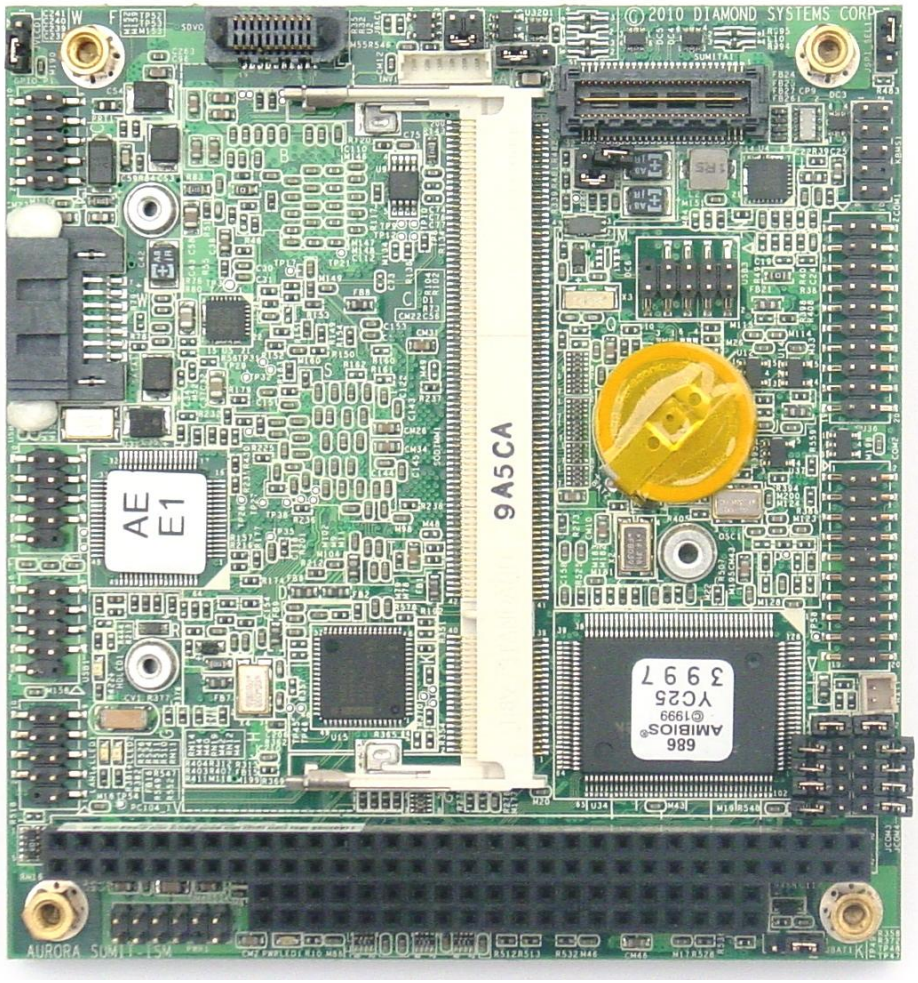
# AURORA Single Board Computer

**PC/104™ Single Board Computer with Atom Z-Series CPU and SUMIT™ Expansion**




| Revision | Date | Comment |
|---|---|---|
| A5 | 1/16/2012 | Minor updates |
| A6 | 2/24/2012 | Added new Z510 models |
| | | |

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# IMPORTANT SAFE-HANDLING INFORMATION

**WARNING: ESD-Sensitive Electronic Equipment!**

**Observe ESD-safe handling procedures when working with this product.**

**Always use this product in a properly grounded work area and wear appropriate ESD-preventive clothing and/or accessories.**

**Always store this product in ESD-protective packaging when not in use.**

## *Safe Handling Precautions*

Aurora contains numerous I/O connectors that connect to sensitive electronic components. This creates many opportunities for accidental damage during handling, installation and connection to other equipment. The list here describes common causes of failure found on boards returned to Diamond Systems for repair. This information is provided as a source of advice to help you prevent damaging your Diamond (or any vendor's) embedded computer boards.

**ESD damage** – This type of damage is almost impossible to detect, because there is no visual sign of failure or damage. The symptom is that the board simply stops working, because some component becomes defective. Usually the failure can be identified and the chip can be replaced.

To prevent ESD damage, always follow proper ESD-prevention practices when handling computer boards.

**Damage during handling or storage** – On some boards we have noticed physical damage from mishandling. A common observation is that a screwdriver slipped while installing the board, causing a gouge in the PCB surface and cutting signal traces or damaging components.

Another common observation is damaged board corners, indicating the board was dropped. This may or may not cause damage to the circuitry, depending on what is near the corner. Most of our boards are designed with at least 25 mils clearance between the board edge and any component pad, and ground / power planes are at least 20 mils from the edge to avoid possible shorting from this type of damage. However these design rules are not sufficient to prevent damage in all situations.

A third cause of failure is when a metal screwdriver tip slips, or a screw drops onto the board while it is powered on, causing a short between a power pin and a signal pin on a component. This can cause overvoltage / power supply problems described below. To avoid this type of failure, only perform assembly operations when the system is powered off.

Sometimes boards are stored in racks with slots that grip the edge of the board. This is a common practice for board manufacturers. However our boards are generally very dense, and if the board has components very close to the board edge, they can be damaged or even knocked off the board when the board tilts back in the rack. Diamond recommends that all our boards be stored only in individual ESD-safe packaging. If multiple boards are stored together, they should be contained in bins with dividers between boards. Do not pile boards on top of each other or cram too many boards into a small location. This can cause damage to connector pins or fragile components.

**Power supply wired backwards** – Our power supplies and boards are not designed to withstand a reverse power supply connection. This will destroy each IC that is connected to the power supply. In this case the board will most likely will be unrepairable and must be replaced. A chip destroyed by reverse power or by excessive power will often have a visible hole on the top or show some deformation on the top surface due to vaporization inside the package. **Check twice before applying power!**

**Bent connector pins** – This type of problem is often only a cosmetic issue and is easily fixed by bending the pins back to their proper shape one at a time with needle-nose pliers. This situation can occur when pulling a ribbon cable off of a pin header. Note: If the pins are bent too severely, bending them back can cause them to weaken unacceptably or even break, and the connector must be replaced.

# 1. INTRODUCTION

Aurora is a high performance, highly integrated single board computer in the PC/104 form-factor incorporating a wealth of standard PC-style I/O plus on-board digital I/O. It accepts both SUMIT-A and PC/104 (ISA) add-on I/O modules. An integrated, bottom-mounted heatspreader dissipates heat efficiently to the system enclosure. This configuration leaves the SBC's top side free for easy access to memory, on-board I/O, and expansion sockets.

Key feature highlights include:

- Compact, low-power, high-performance, stackable SBC
- Intel Atom Z530 CPU at 1.6GHz or Z510 at 1.1GHz
- Up to 2GB ruggedized RSODIMM™ DDR2 SDRAM
- Comprehensive set of I/O interfaces
- Optional on-board USB flashdisk
- PC/104 form-factor
- PC/104 (ISA) and SUMIT-A (PCIe) stackable expansion
- -40°C to +80°C (-40°F to +176°F) operating temperature at heatspreader surface

Aurora's features are summarized on the next page.

**Figure 1: Edge View of the Aurora SBC**

| *Aurora Models* | *Processor Type* | *Processor Clock* | *SO-DIMM RAM* |
|---|---|---|---|
| AUR-Z530-16-0G | Intel Atom Z530P | 1.6GHz | 0GB SDRAM |
| AUR-Z530-16-1G | Intel Atom Z530P | 1.6GHz | 1GB SDRAM |
| AUR-Z530-16-2G | Intel Atom Z530P | 1.6GHz | 2GB SDRAM |
| AUR-Z510-11-0G | Intel Atom Z510 | 1.1GHz | 0GB SDRAM |
| AUR-Z510-11-1G | Intel Atom Z510 | 1.1GHz | 1GB SDRAM |

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## 1.1 Aurora SBC Features

Aurora is a rugged, single board computer (SBC) based on the 1.6GHz Intel Atom Z-Series CPU and conforming to the compact, PC/104 form-factor (90 x 96mm). It provides multiple expansion options by means of PC/104 (ISA) modules and SUMIT-A modules.

**Functions**

- Processor: Intel Atom Z530P at 1.6GHz or Z510 at 1.1GHz
- Cooling: Heatspreader, fanless
- Memory: Up to 2GB ruggedized RSODIMM™ DDR2 DRAM
- Display options:
  - LVDS flat panel interface
    Diamond supports Sharp LQ121S1LG41 and LQ121S1LG42 flat panels
  - SDVO (optional VGA adapter accessory available)
- LVDS backlight power: +5V or +12V jumper selectable
- USB ports: 4 USB 2.0
- Serial ports: 2 RS-232/422/485, 2 RS-232
- Networking: 1 Gigabit Ethernet – Intel 82574IT
- Mass storage:
  - 1 SATA port
  - Support for up to 8GB USB flashdisk
- Keyboard/Mouse: PS/2 with BIOS support for USB
- Digital I/O: 8 digital I/O lines
- Watchdog Timer: Yes
- PCI Express: 1 PCIe x1 lane to SUMIT-A bus
- Expansion buses:
  - SUMIT-A stackable
  - PC/104 (ISA) stackable
- Input power: 5V ±5%
- Power consumption: 5.4W
- Operating temp.: -40°C to +80°C (-40°F to +176°F) at heatspreader surface
- Dimensions: 3.55" x 3.775" x 0.9” (90mm x 96mm x 23mm)
- Weight: 7.5oz / 212g
- RoHS Compliant

**Operating System Support**

- Linux 2.6
- Windows XP and XPe

## 1.2 SUMIT Socket Resources

Aurora's SUMIT-A expansion socket provides the host interface resource support indicated in the table below. For further details on the SUMIT expansion standard, visit SFF-SIG.org/sumit.html.

| SUMIT Resources | | |
|---|---|---|
| **Company:** | Diamond Systems Corp. | |
| **Product:** | Aurora SBC | |
| **Form-factor:** | PC/104 | |
| | **SUMIT A** | **SUMIT B** |
| **PCIe x1** | 1 | |
| **PCIe x4** | | |
| **USB** | 3 | |
| **ExpressCard** | – | |
| **LPC** | √ | |
| **SPI /uWire** | – | |
| **SMBus/ I2C** | SMBus | |
| **+12V** | √ | |
| **+5V** | √ | |
| **+5Vsb** | – | |
| **+3.3V** | √ | |
| Notes: www.sff-sig.org/sumitlabel.html | | |

## 1.3 Software Compatibility

Aurora is compatible with Linux, Windows XP, and Windows Embedded Standard. All necessary drivers for these operating systems are provided with the product.

## 1.4 Thermal Considerations and Heatspreader

All models of Aurora are specified for a -40°C to +80°C operating range, the temperature being measured at the outside surface of the heatspreader. Diamond provides a heatspreader attached to the Aurora single board computer as a conductive cooled thermal layer. However, this heatspreader by itself does not constitute the complete thermal solution necessary for any specific implementation, but provides a common interface between the single board computer and the customer's implementation-specific thermal solution.

The outside surface of the Aurora heatspreader must be kept at a temperature not to exceed +80°C. If your environment causes the temperature on the outside surface of the heatspreader to exceed this temperature, you are responsible for removing the additional heat from the system through either an additional passive thermal solution or fan solution.

Aurora's integrated heatspreader makes thermal contact with the heat generating components and provides a flat surface on the bottom of the assembly for mating to the system enclosure. This technique facilitates efficient removal of heat from the SBC without the need for a fan. Four mounting holes on the bottom of the conduction cooled heatspreader are provided to mount Aurora in an enclosure or to a bulkhead. These mounting holes are #6-32 threaded holes on 2.8" centers.

# 2. FUNCTIONAL OVERVIEW

## 2.1 Block Diagram

Figure 2 shows Aurora's functional blocks.

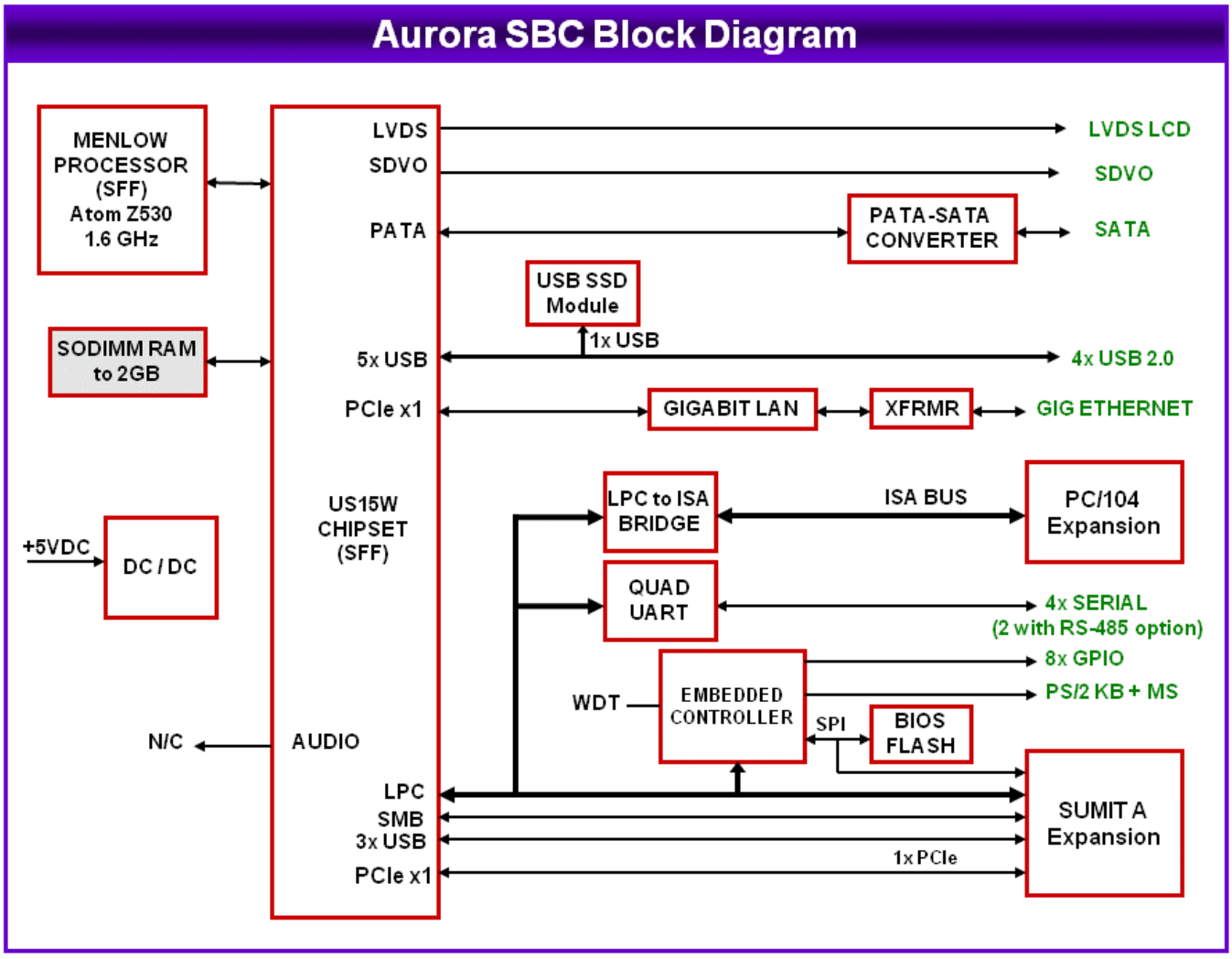



**Figure 2: Aurora Functional Block Diagram**

## 2.2 Aurora Dimensions

Figure 3 shows the overall dimensions of the Aurora SBC.

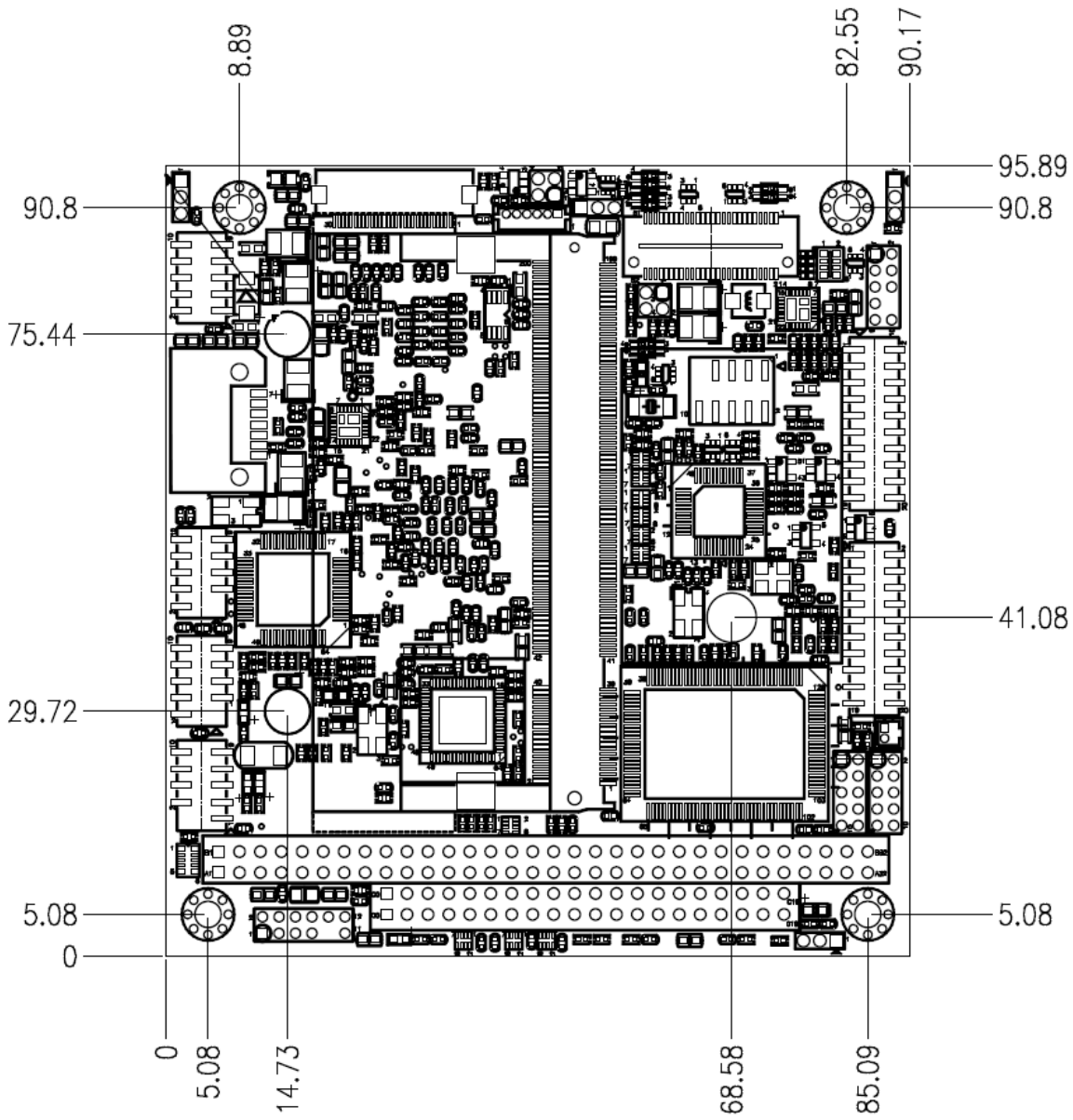



**Figure 3: Aurora Dimensions**

## 2.3 Connector Locations

Figure 4 illustrates the position of interface and bus connectors jumpers located on the top side of the Aurora SBC. Two expansion buses – PC/104 (ISA) and SUMIT-A (PCIe, etc.) – enable on-board stacking of additional I/O boards. The connectors for both expansion buses are located on the top side of the board.

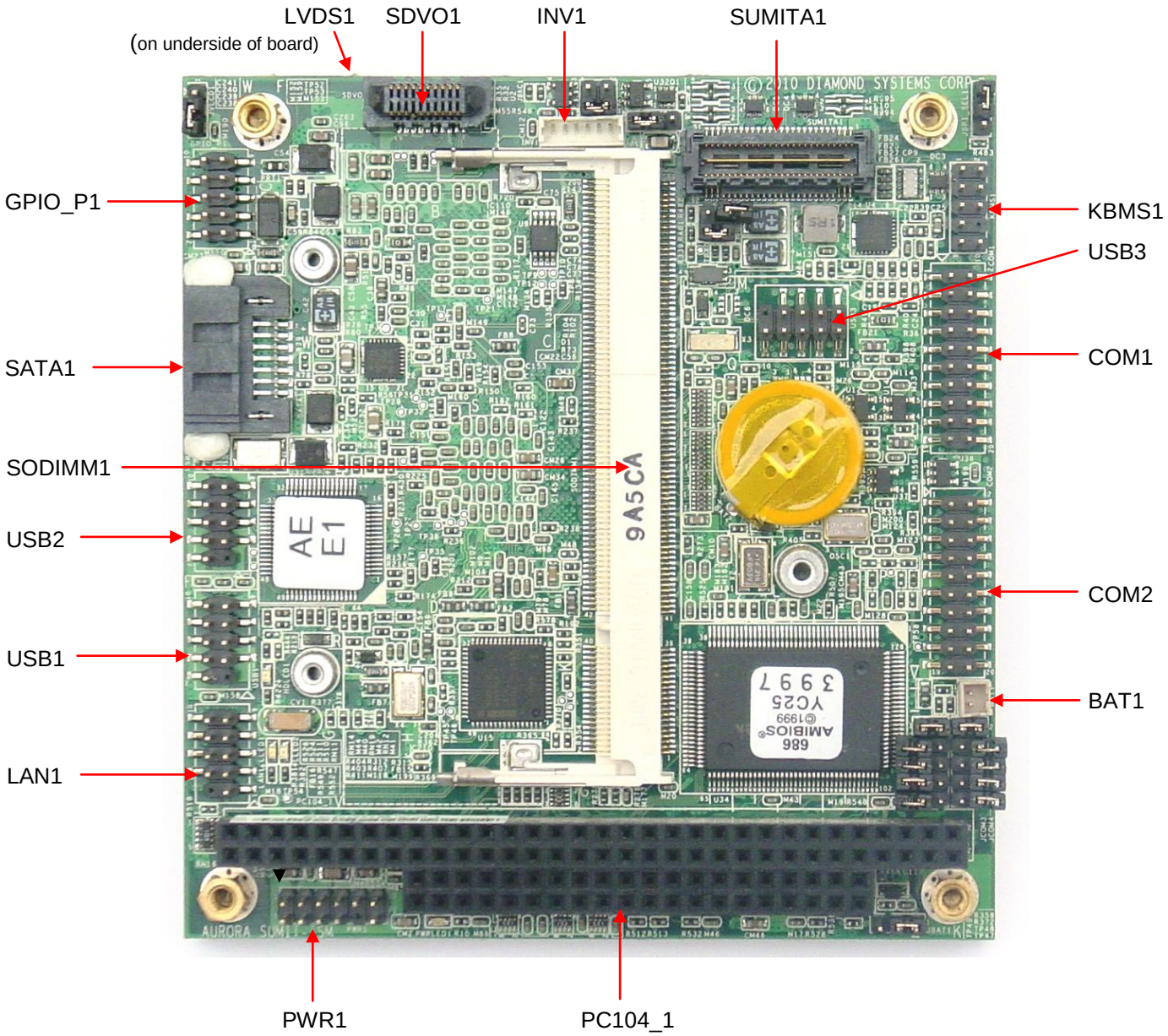



Figure 4: Aurora SBC Connector Locations

### 2.3.1 Connector Summary

The following table summarizes the functions of Aurora's interface, utility, and power connectors. Signal functions relating to all of Aurora's interface connectors are discussed in greater detail in Section 4 of this document. Diamond offers an optional Aurora Cable Kit (number C-AUR-KIT), which provides mating cable assemblies for most of Aurora's I/O interface connectors.

| *Connector Function* | *Silkscreen Label* | *Connector Type* |
|---|---|---|
| Serial Digital Video Out | SDVO1 | 20-pin vertical connector |
| LCD Backlight | INV1 | 6-pin header |
| SUMIT-A Bus | SUMITA1 | 52-pin female socket |
| PS/2 Keyboard Mouse | KBMS1 | 10-pin dual-row header |
| On-board USB flashdisk | USB3 | 10-pin dual-row header |
| Serial Ports | COM1 (for Port1 & Port2)<br>COM2 (for Port3 & Port4) | 20-pin dual-row header |
| External Battery Input | BAT1 | 2-pin plug |
| PC/104 Expansion Bus | PC104_1 | 104-pin quad-row socket |
| Input Power | PWR1 | 12-pin dual-row header |
| Ethernet | LAN1 | 10-pin dual-row header |
| USB Ports | USB1, USB2 | 10-pin dual-row header |
| SO-DIMM DRAM | SODIMM1 | SO-DIMM memory socket |
| SATA | SATA1 | 7-pin standard SATA interface |
| GPIO | GPIO_P1 | 10-pin dual-row header |
| LCD (LVDS) Panel | LVDS1 | 20-pin single-row header |

## 2.4 Configuration Jumpers

Figure 5 shows the configuration jumper groups that are located on the topside of the Aurora SBC. Refer to Section 5 for details on the functions and configuration options associated with each jumper group.

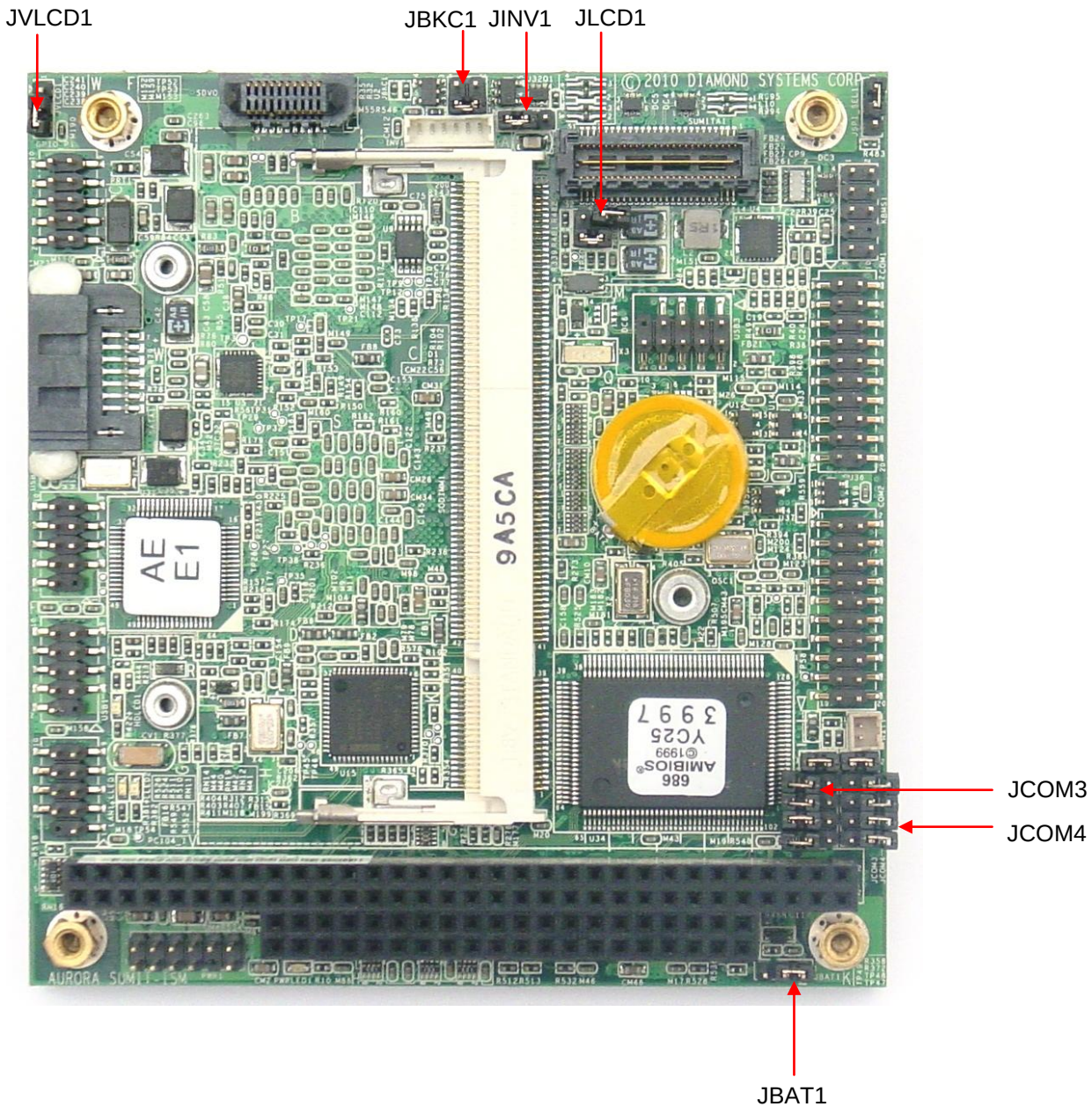



**Figure 5: Aurora SBC Configuration Jumper Groups**

### 2.4.1 Configuration Jumper Summary

Aurora's configuration jumpers are listed below. Refer to Section 5 of this document for details regarding the configuration of these jumper groups.

| *Jumper Group Function* | *Silkscreen Label* | *Array Size* |
|---|---|---|
| LCD Panel Power Select (3.3V/5V) | JVLCD1 | 1 x 3 |
| LCD Backlight Brightness Control | JBKC1 | 2 x 2 |
| LCD Backlight Power ( 5V/12V) | JINV1 | 1 x 3 |
| LCD Scan Direction | JLCD1 | 2 x 2 |
| Serial Ports 3 and 4 RS-422/485 configuration | JCOM3, JCOM4 | 2 x 5 |
| CMOS RAM Reset / On-Board Backup Battery Disconnect | JBAT1 | 1 x 3 |

# 3. GETTING STARTED

First-time Aurora users normally receive the product as part of Diamond's Aurora Development Kit, which provides everything needed to ensure rapid application development. This section of the Aurora User Manual covers basic hardware setup, power connection, system boot-up, and initial software configuration. After Aurora is up and running, refer to the later sections of this manual for the detailed hardware and software reference information needed to adapt the product to specific applications.

Important Safe-Handling Information

WARNING: ESD-Sensitive Electronic Equipment!

Observe ESD-safe handling procedures when working with this product.

Always use this product in a properly grounded work area and wear appropriate ESD-preventive clothing and/or accessories.

Always store this product in ESD-protective packaging when not in use.

Please refer to page 4 of this manual ("Important Safe-Handling Information") for further details.

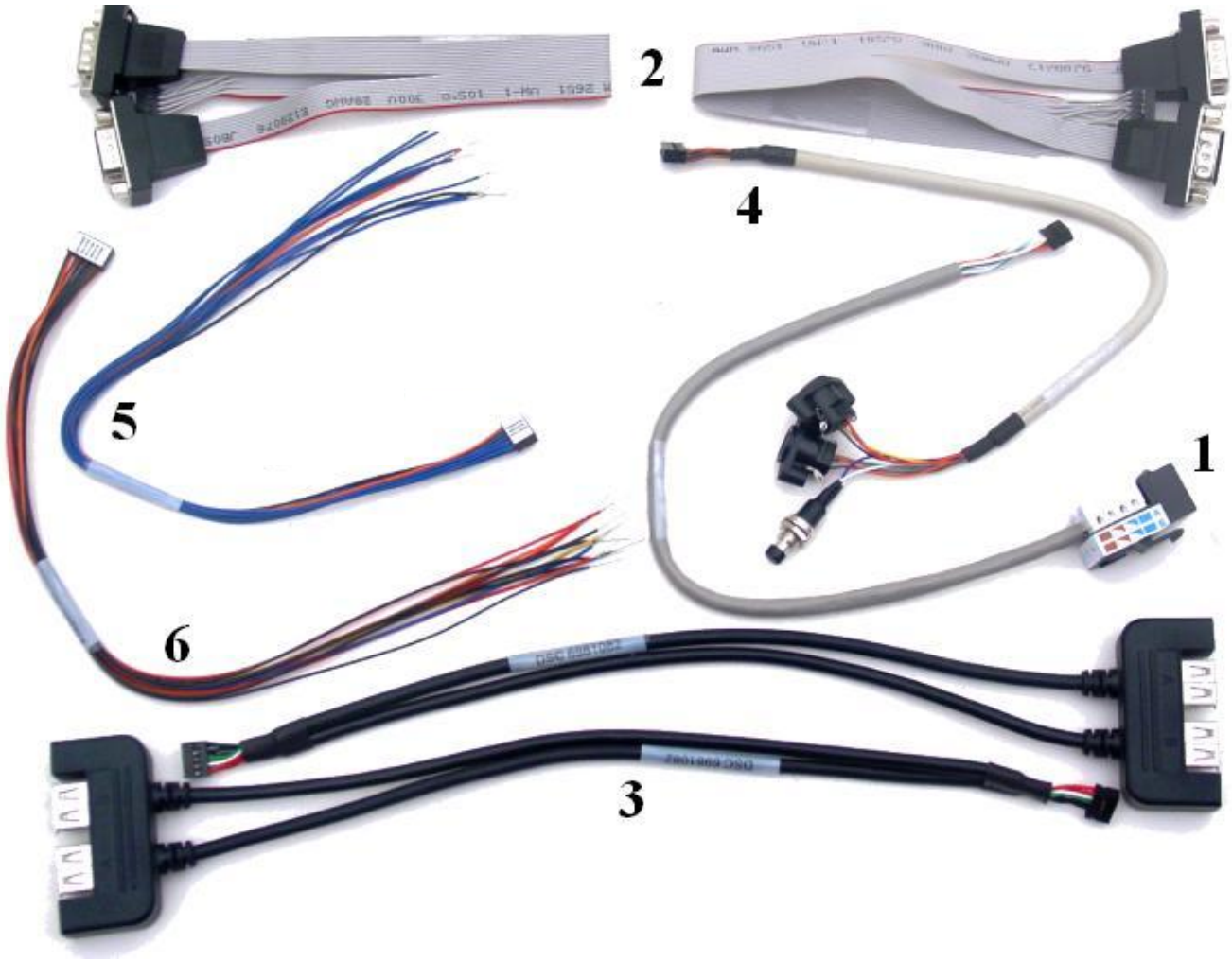
## 3.1 Introducing the Aurora Development Kit

The Aurora Development Kit (DK-AUR-01) provides everything required for Aurora-based rapid application development. The table below lists the boards, cables, and other items included.

| *Item* | *Diamond P/N* | *Description* |
|---|---|---|
| 1 | AUR-Z530-16-1G | Aurora PC/104 SBC, 1.6GHz Atom Z530, 1GB SDRAM |
| 2 | ACC-VGA-03 | VGA Accessory Kit for Aurora |
| 3 | 8890300 | 4GB USB flashdisk with Linux pre-loaded |
| 4 | PS-5V-04 | AC Power Adapter, +5VDC |
| 5 | 7460610 | Quickstart Guide for Aurora SBC |
| 6 | C-AUR-KIT | Aurora Cable Kit for on-board I/O |
| 7 | DOC-PKG | Documentation Package |
| 8 | 6981037 | PS-5V-04 to Aurora power cable |

### 3.1.1 Aurora Cable Kit

The Aurora Cable Kit (number C-AUR-KIT) provides convenient access to most of Aurora's I/O features. The kit's cable assemblies are shown in the photo below, and identified in the table that follows.




***Note:*** *On each interface cable, the end of the cable connector that has a red wire going to it should be oriented toward the end of the board connector that is labeled "pin 1" (typically the pin with a square pad on the PCB).*

| *Item* | *Qty* | *Description* | *Diamond P/N* | *Connects to…* |
|---|---|---|---|---|
| 1 | 1 | Ethernet cable, 2x5 2mm | 6981080 | LAN1 |
| 2 | 2 | Dual Serial port cable, 2x20 2mm | 6981081 | COM1, COM2 |
| 3 | 2 | Dual USB cable, 2x5 2mm | 6981082 | USB1, USB2 |
| 4 | 1 | PS/2 Keyboard Mouse, 2x5 2mm | 6981301 | KBMS1 |
| 5 | 1 | Digital I/O cable, 2x5 2mm | 6981302 | GPIO_P1 |
| 6 | 1 | Power input cable, 2x6 2mm | 6981303 | PWR1 |

## 3.2 System Setup

This section outlines a simple process for preparing Aurora for first-time operation using the Aurora Development Kit. Additional details regarding Aurora's interface functions and connections may be found in Section 4 of this document ("Interface Connector Details").

### 3.2.1 Keyboard and Mouse

Aurora supports operation using PS/2-based keyboard and mouse devices. Plug the keyboard and mouse cable, 6981301, from the Aurora Cable Kit into the connector KBMS1 on Aurora. Then plug the keyboard and mouse into the mating connectors on the Aurora interface cables.

### 3.2.2 USB Flashdisk Socket

Aurora provides a location for on-board installation of an optional USB flashdisk on connector USB3. Plug the USB flashdisk module, 8890300, in the Development Kit into connector USB3 on Aurora. Remove the screw from the mounting stand-off before installing the flashdisk. Secure the flashdisk to Aurora with the screw once the flashdisk is installed.

### 3.2.3 Mass Storage Devices

If desired, connect SATA hard drives to Aurora by connecting a USB cable, part number 6981082, to connector USB1 and then to the SATA drive. Aurora can operate with a combination of SATA and CD-ROM drives, and can boot from either of them.

> ***Caution!*** *Be sure the PS-5V-01 AC power adapter is disconnected from its AC power source prior to performing the following step…*

### 3.2.4 Connecting Power

Connect cable 6981037 to the PS-5V-01 AC power adapter. Connect the other end of the 6981037 cable to connector PWR1 on the Aurora SBC.

### 3.2.5 Display

Aurora provides interfaces for both LVDS flat panel displays and SDVO output. VGA CRTs can also be used via an external SDVO to VGA converter. This quick-start process assumes you are using the external VGA converter (number ACC-VGA-03) supplied with the development kit.

Install the I/O board provided in the ACC-VGA-03 kit on top of Aurora, aligning the PC/104 and SUMIT-A connectors. Connect the VGA cable supplied in the ACC-VGA-03 between the VGA connector on the I/O board and a VGA-compatible display.

### 3.2.6 Installing Aurora in an Enclosure (optional)

Install the Aurora single board computer in an enclosure that has an appropriate mounting-hole pattern (2.8" square).

Aurora's heatspreader has four #6-32 threaded holes on 2.8" centers for mounting. Select four #6-32 threaded screws of the proper length and head type to work with your enclosure. Allow a minimum of 0.25" and maximum of 0.40" screw length for insertion into Aurora's heatspreader. The total screw length will depend on the thickness of your enclosure wall.

## 3.3 Booting the System

Power-up the VGA video monitor. Then plug the PS-5V-01 AC power adapter to an AC outlet. Aurora should begin its boot-up sequence immediately, as evidenced by BIOS messages on the connected VGA display. You can run the BIOS Setup utility and proceed to install an operating system on the boot drive just as you would on a normal desktop PC.

### 3.3.1 BIOS Setup

Aurora's BIOS provides a wide range of configuration options. When you power up Aurora for the first time, you should immediately enter the BIOS "Setup" utility in order to adjust BIOS settings to match your system's peripheral devices and other requirements, and to configure various other hardware and software parameters.

Options configurable via Setup typically include:

- Number and type of mass storage devices
- Boot device priority
- Video display type and resolution
- IDA, SATA, serial, and parallel interface modes and protocols
- PCI and PnP configuration
- Power management setup
- Automatic power-up after LAN connection, RTC alarm, power resumption, etc.
- System monitoring and security functions

### 3.3.2 Operating System Drivers

Aurora will boot and run a Linux 2.6 operating system from the USB flashdisk. Aurora should now be fully operational.

If you desire to run a different operating system, depending on the operating system to be installed, it may be necessary to install software drivers for on-board interface controllers. Drivers for Windows XP, XPe, and Linux 2.6, if required, are included on the Software and Documentation CD that is included in the Aurora Development Kit. This software is also available for download from the Aurora page at Diamond's website, www.diamondsystems.com/products/aurora.

# 4. INTERFACE CONNECTOR DETAILS

This section describes the functions associated with the Aurora baseboard's SUMIT-A bus, PCI-104 bus expansion stack, utility, I/O interfaces, and power connectors in greater detail. Section 3.1.1 contains a list of ready-to-use interface cables included in Diamond's Aurora Cable Kit.

## 4.1 SDVO Connector (SDVO1)

The SDVO connector provides differential pair video output signals.

An optional SDVO to VGA converter accessory, number ACC-VGA-03, interfaces with this connector and provides signals for directly driving VGA-interfaced CRTs and LCDs. The VGA converter I/O board provides a standard DE-15 VGA connector.

| | |
|---|---|
| **1** | SDVO_B_BLUE# |
| **2** | BUF_PLT_RST# |
| **3** | SDVO_B_BLUE |
| **4** | Ground |
| **5** | Ground |
| **6** | SDVO_B_GREEN# |
| **7** | SDVO_CTRLCLK |
| **8** | SDVO_B_GREEN |
| **9** | SDVO_CTRLDATA |
| **10** | Ground |
| **11** | Ground |
| **12** | SDVO_B_CLK_N |
| **13** | +3.3V |
| **14** | SDVO_B_CLK_P |
| **15** | +3.3V |
| **16** | Ground |
| **17** | +5V |
| **18** | SDVO_B_RED# |
| **19** | +5V |
| **20** | SDVO_B_RED |

**PCB connector:** SAMTEC ERM8-010-08.0-L-DV 20 pin 0,800 mm pin spacing
**Mating connector:** SAMTEC ERF8-010-07.0-L-DV

## 4.2 LCD Panel (LVDS Interface) Connector (LVDS1)

This connector is mounted on the bottom side of Aurora, directly below the SDVO connector, SDVO1. It provides connection to an LVDS LCD display. The LCD panel power is jumpeRSelectable for 3.3V (default) or 5V.

| | |
|---|---|
| **1** | Ground / D3+, depending on video chip |
| **2** | Ground / D3-, depending on video chip |
| **3** | Scan Direction (High = Reverse Scan, Low/open = Normal Scan) |
| **4** | Frame Rate Control (High = On, Low/open = Off) |
| **5** | Signal Ground |
| **6** | Pixel Clock + |
| **7** | Pixel Clock - |
| **8** | Signal Ground |
| **9** | D2+ |
| **10** | D2- |
| **11** | Signal Ground |
| **12** | D1+ |
| **13** | D1- |
| **14** | Signal Ground |
| **15** | D0+ |
| **16** | D0- |
| **17** | Power Ground |
| **18** | Power Ground |
| **19** | Vcc 3.3V / 5V (jumper configured) |
| **20** | Vcc 3.3V / 5V (jumper configured) |

**PCB connector:** JAE part no. FI-SE20P-HFE or equivalent
**Cable-mount socket:** JAE part no. FI-SE20S-2-L or equivalent

## 4.3 LCD Backlight Connector (INV1)

This connector provides the backlight power and control for the optional LCD panel. The brightness control for the LCD backlight can be found on jumper JBKC1. Note: If needed, +12V must be provided on the input power connector.

| | |
|---|---|
| **1** | Power +5V/+12V, jumper selectable |
| **2** | Power (same as pin 1) |
| **3** | Ground |
| **4** | Ground |
| **5** | Enable (GPIO output), 0 = off, open circuit = on |
| **6** | Brightness, 0-5VDC variable; 0V = max, 5V = min |

**PCB connector:** Molex 53047-0610 or equivalent

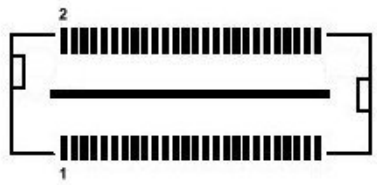
**Mating connector and pin types:** Socket: Molex 51021-0600 or equivalent

Terminals: Molex 50058 / 50079 series or equivalent

## 4.4 SUMIT-A Expansion Bus (SUMITA1)

The SUMIT-A stackable bus is a 52-pin surface mount connector located on the expansion side of the board. Aurora implements the following SUMIT bus functions:

- 1 PCIe x1 lane
- 3 USB 2.0 channels
- LPC bus
- SMBus
- SPI, if a chip select is available from the embedded controller IC




The standard signal assignments of the SUMIT-A connector appear in below. Note: For more information on the SUMIT specification, visit the SFF-SIG website at http://www.sff-sig.org.

| | | | |
|---|---|---|---|
| +5VSB | 1 | 2 | +12V |
| 3.3V | 3 | 4 | SMB/I2C_DATA |
| 3.3V | 5 | 6 | SMB/I2C_CLK |
| EXPCD_REQ# | 7 | 8 | SMB/I2C_ALERT# |
| EXPCD_PRSNT# | 9 | 10 | SPI/uWire_DO |
| USB_OC# | 11 | 12 | SPI/uWire_DI |
| RSVD | 13 | 14 | SPI/uWire_CLK |
| +5V | 15 | 16 | SPI/uWire_CS0# |
| USB3+ | 17 | 18 | SPI/uWire_CS1# |
| USB3- | 19 | 20 | Reserved |
| +5V | 21 | 22 | LPC_DRQ |
| USB2+ | 23 | 24 | LPC_AD0 |
| USB2- | 25 | 26 | LPC_AD1 |
| +5V | 27 | 28 | LPC_AD2 |
| USB1+ | 29 | 30 | LPC_AD3 |
| USB1- | 31 | 32 | LPC_FRAME# |
| +5V | 33 | 34 | SERIRQ# |
| USB0+ | 35 | 36 | LPC_PRSNT#/GND |
| USB0- | 37 | 38 | CLK_33MHz |
| Ground | 39 | 40 | Ground |
| A_PETp0 | 41 | 42 | A_PERp0 |
| A_PETn0 | 43 | 44 | A_PERn0 |
| Ground | 45 | 46 | APRSNT#/GND |
| PERST# | 47 | 48 | A_CLKp |
| WAKE# | 49 | 50 | A_CLKn |
| +5V | 51 | 52 | Ground |

## 4.5 Serial Ports (COM1, COM2)

These connectors provide access to the board's four serial ports. COM1 provides access to Port1 and Port2. COM2 provides access to Port3 and Port4.

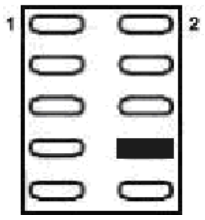
Ports 1 and 2 are fixed for RS-232 only, while ports 3 and 4 may be jumper-configured for RS-232, RS-422, or RS-485 protocols. The connector pinout changes depending on the selected protocol. Aurora can be custom-ordered preconfigured for a selected protocol; it is also possible to order a fixed configuration with soldered-on zero ohm resistors, so no jumpers are used.

| | RS-232 Configuration | | | | RS-422 Configuration | | | | RS-485 Configuration | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Port 1 | DCD 1 | 1 | 2 | DSR 1 | | 1 | 2 | | | 1 | 2 | |
| | RXD 1 | 3 | 4 | RTS 1 | | 3 | 4 | | | 3 | 4 | |
| | TXD 1 | 5 | 6 | CTS 1 | | 5 | 6 | | | 5 | 6 | |
| | DTR 1 | 7 | 8 | RI 1 | | 7 | 8 | | | 7 | 8 | |
| | Ground | 9 | 10 | NC | | 9 | 10 | | | 9 | 10 | |
| Port 2 | DCD 2 | 11 | 12 | DSR 2 | | 11 | 12 | | | 11 | 12 | |
| | RXD 2 | 13 | 14 | RTS 2 | | 13 | 14 | | | 13 | 14 | |
| | TXD 2 | 15 | 16 | CTS 2 | | 15 | 16 | | | 15 | 16 | |
| | DTR 2 | 17 | 18 | RI 2 | | 17 | 18 | | | 17 | 18 | |
| | Ground | 19 | 20 | NC | | 19 | 20 | | | 19 | 20 | |
| Port 3 | DCD 3 | 1 | 22 | DSR 3 | NC | 21 | 22 | RXD- 3 | NC | 21 | 22 | NC |
| | RXD 3 | 3 | 24 | RTS 3 | RXD+ 3 | 23 | 24 | TXD- 3 | NC | 23 | 24 | TXD/RXD- 3 |
| | TXD 3 | 5 | 26 | CTS 3 | TXD+ 3 | 25 | 26 | NC | TXD/RXD+ 3 | 25 | 26 | NC |
| | DTR 3 | 7 | 28 | RI 3 | NC | 27 | 28 | NC | NC | 27 | 28 | NC |
| | Ground | 9 | 30 | NC | Ground | 29 | 30 | NC | Ground | 29 | 30 | NC |
| Port 4 | DCD 4 | 11 | 32 | DSR 4 | NC | 31 | 32 | RXD- 4 | NC | 31 | 32 | NC |
| | RXD 4 | 13 | 34 | RTS 4 | RXD+ 4 | 33 | 34 | TXD- 4 | NC | 33 | 34 | TXD/RXD- 4 |
| | TXD 4 | 15 | 36 | CTS 4 | TXD+ 4 | 35 | 36 | NC | TXD/RXD+ 4 | 35 | 36 | NC |
| | DTR 4 | 17 | 38 | RI 4 | NC | 37 | 38 | NC | NC | 37 | 38 | NC |
| | Ground | 19 | 40 | NC | Ground | 39 | 40 | NC | Ground | 39 | 40 | NC |

**Connector type:** Standard 2mm dual row straight pin header with 4mm posts and gold flash plating

**Mating connector and pin types:** Molex 51110-2050 connector with Molex 50394-8100 terminals

## 4.6 PS/2 Keyboard/Mouse (KBMS1)




This connector provides the standard PS/2 keyboard and mouse signals.

| | | | |
|---|---|---|---|
| +5V | 1 | 2 | No connection |
| KB Data | 3 | 4 | MS Data |
| KB Clk | 5 | 6 | MS Clk |
| KB Ground | 7 | 8 | **Key** |
| KB Ground | 9 | 10 | RESET BTN# |

**Connector type:** Standard 2mm dual row straight pin header with 4mm posts and gold flash plating

**Mating connector and pin types:** A2005H02 2x5P connector with A2005T0P-00 terminals

## 4.7 External Battery (BAT1)

Aurora has provision for an external battery connection via BAT1, a two-pin connector.

A connector and jumper are provided to disable the on-board battery and enable use of an external battery instead. The external battery voltage requirement is 3.3V +/-10%. The jumper also clears the CMOS RAM when it is removed and no external battery is connected.

| | |
|---|---|
| 1 | Ground |
| 2 | Battery+ |

**Connector type:** Shrouded 2mm header with key notch

**Mating connector and pin types:** Molex 51021-0200 connector with Molex 50079-8000 contacts

## 4.8 PC/104 (ISA) Expansion Bus (PC104_1)

The PC/104 bus is essentially identical to the ISA Bus except for the physical design. It specifies two pin and socket connectors for the bus signals. A 64-pin header incorporates the 62-pin 8-bit bus connector signals, and a 40-pin header incorporates the 36-pin 16-bit bus connector signals. The additional pins on the PC/104 connectors are used as ground or key pins. The female sockets on the top of the board enable stacking another PC/104 board on top of the board, while the male pins on the bottom enable the board to plug into another board below it.

In the pinout figures below, the tops correspond to the left edge of the connector when the board is viewed from the primary side (side with the female end of the PC/104 connector) and the board is oriented so that the PC/104 connectors are along the bottom edge of the board.

Note: For more information on the PC/104 specification, visit the PC/104 Embedded Consortium website, at http://www.pc104.org.

**View from Top of Board**

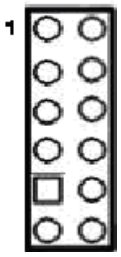
**PC/104 8-bit bus connector**

| | | | |
|---|---|---|---|
| IOCHK- | A1 | B1 | Ground |
| SD7 | A2 | B2 | RESET |
| SD6 | A3 | B3 | +5V |
| SD5 | A4 | B4 | IRQ9 |
| SD4 | A5 | B5 | -5V |
| SD3 | A6 | B6 | DRQ2 |
| SD2 | A7 | B7 | -12V |
| SD1 | A8 | B8 | OWS- |
| SD0 | A9 | B9 | +12V |
| IOCHRDY | A10 | B10 | KEY |
| AEN | A11 | B11 | SMEMW-W |
| SA19 | A12 | B12 | SMEMR- |
| SA18 | A13 | B13 | IOW- |
| SA17 | A14 | B14 | IOR- |
| SA16 | A15 | B15 | DACK3- |
| SA15 | A16 | B16 | DRQ3 |
| SA14 | A17 | B17 | DACK1- |
| SA13 | A18 | B18 | DRQ1 |
| SA12 | A19 | B19 | REFRESH- |
| SA11 | A20 | B20 | SYSCLK |
| SA10 | A21 | B21 | IRQ7 |
| SA9 | A22 | B22 | IRQ6 |
| SA8 | A23 | B23 | IRQ5 |
| SA7 | A24 | B24 | IRQ4 |
| SA6 | A25 | B25 | IRQ3 |
| SA5 | A26 | B26 | DACK2- |
| SA4 | A27 | B27 | TC |
| SA3 | A28 | B28 | BALE |
| SA2 | A29 | B29 | +5V |
| SA1 | A30 | B30 | OSC |
| SA0 | A31 | B31 | Ground |
| Ground | A32 | B32 | Ground |

**PC/104 16-bit bus connector**

| | | | |
|---|---|---|---|
| Ground | C0 | D0 | Ground |
| SBHE- | C1 | D1 | MEMCS16- |
| LA23 | C2 | D2 | IOCS16- |
| LA22 | C3 | D3 | IRQ10 |
| LA21 | C4 | D4 | IRQ11 |
| LA20 | C5 | D5 | IRQ12 |
| LA19 | C6 | D6 | IRQ15 |
| LA18 | C7 | D7 | IRQ14 |
| LA17 | C8 | D8 | DACK0- |
| MEMR- | C9 | D9 | DRQ0 |
| MEMW- | C10 | D10 | DACK5- |
| SD8 | C11 | D11 | DRQ5 |
| SD9 | C12 | D12 | DACK6- |
| SD10 | C13 | D13 | DRQ6 |
| SD11 | C14 | D14 | DACK7- |
| SD12 | C15 | D15 | DRQ7 |
| SD13 | C16 | D16 | +5V |
| SD14 | C17 | D17 | MASTER- |
| SD15 | C18 | D18 | Ground |
| KEY | C19 | D19 | Ground |

## 4.9 Input Power (PWR1)



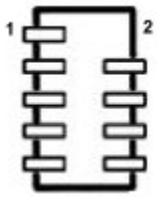

The power signals on this connector come from a connector leading to the output from a DC/DC power supply installed in the system.

| | | | |
|---|---|---|---|
| Ground | 1 | 2 | +5VDC |
| Ground | 3 | 4 | +12VDC |
| Ground | 5 | 6 | |
| Ground | 7 | 8 | +5VDC |
| **Key** | 9 | 10 | +5VDC |
| Ground | 11 | 12 | Ext Bat1 |

**Connector type:** Standard dual row 2mm pitch straight pin header with gold flash plating

**Mating connector and pin types:** A2005H02 2x6P connector with A2005T0B-00 terminals

## 4.10 Ethernet (LAN1)



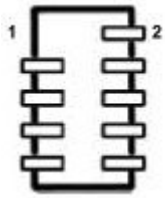

This connector provides access to the board's gigabit Ethernet port.

| | | | |
|---|---|---|---|
| Common | 1 | 2 | **Key** |
| DA+ | 3 | 4 | DA- |
| DB+ | 5 | 6 | DB- |
| DC+ | 7 | 8 | DC- |
| DD+ | 9 | 10 | DD- |

**Connector type:** Standard 2mm dual row vertical pin header with 4mm posts and gold flash plating

**Mating connector:** Molex 51110-1050 connector

## 4.11 USB 0-1 (USB1)



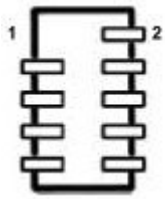

This connector provides access to two of the board's four USB 2.0 ports, USB0 and USB1. The shield pin is tied to system ground.

| | | | |
|---|---|---|---|
| **Key** | **1** | **2** | Shield |
| USB1 Pwr- | **3** | **4** | USB0 Pwr- |
| USB1 Data+ | **5** | **6** | USB0 Data+ |
| USB1 Data- | **7** | **8** | USB0 Data- |
| USB1 Pwr+ | **9** | **10** | USB0 Pwr+ |

**Connector type:** Standard 2mm vertical pin header with 4mm posts and gold flash plating

**Mating connector and pin types:** Molex 51110-1050 connector with Molex 50394-8100 terminals

## 4.12 USB 2-3 (USB2)



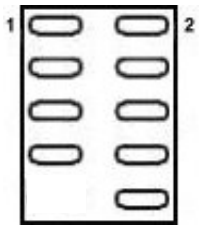

This connector provides access to two of the board's four USB 2.0 ports, USB2 and USB3. The shield pin is tied to system ground.

| | | | |
|---|---|---|---|
| **Key** | **1** | **2** | Shield |
| USB3 Pwr- | **3** | **4** | USB2 Pwr- |
| USB3 Data+ | **5** | **6** | USB2 Data+ |
| USB3 Data- | **7** | **8** | USB2 Data- |
| USB3 Pwr+ | **9** | **10** | USB2 Pwr+ |

**Connector type:** Standard 2mm dual row vertical pin header with 4mm posts and gold flash plating

**Mating connector and pin types:** Molex 51110-1050 connector with Molex 50394-8100 terminals

## 4.13 USB Flashdisk (USB3)




This connector is used for the USB on-board flashdisk interface. This is a dedicated USB port. An accessory cable, C-FDU-01, is available that connects the USB flashdisk to any USB port. This simplifies programming the flashdisk, or downloading data from it, by providing a direct connection between the flashdisk and a host PC.

| | | | |
|---|---|---|---|
| USB7 Pwr+ | **1** | **2** | NC |
| USB7 Data- | **3** | **4** | NC |
| USB7 Data+ | **5** | **6** | NC |
| USB7 Pwr- | **7** | **8** | NC |
| **Key** | **9** | **10** | NC |

**Connector type:** Standard 2mm dual straight pin header with 4mm posts and gold flash plating

## 4.14 SO-DIMM DRAM (SODIMM1)

A standard SO-DIMM DDR2 DRAM connector is provided for system memory.

## 4.15 SATA (SATA1)

The SATA connector is an industry-standard connector.

| | |
|---|---|
| 1 | Ground |
| 2 | Transmit+ |
| 3 | Transmit- |
| 4 | Ground |
| 5 | Receive- |
| 6 | Receive+ |
| 7 | Ground |

**Connector type:** Industry-standard horizontal SATA connector, SATA 7P female with lock

### 4.16 GPIO (GPIO_P1)

The GPIO connector is a standard 2mm dual row vertical pin header with 4mm posts and gold flash plating.

| | | | |
|---|---|---|---|
| GPIO0 | 1 | 2 | GPIO1 |
| GPIO2 | 3 | 4 | GPIO3 |
| GPIO4 | 5 | 6 | GPIO5 |
| GPIO6 | 7 | 8 | GPIO7 |
| Ext. Reset Input | 9 | 10 | Ground |

**Connector type:** Standard 2mm dual row vertical pin header with 4mm posts and gold flash plating

**Mating connector and pin types:** A2005H02 2x5P connector with A2005T0B-00 terminals

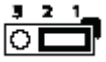
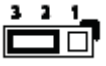
# 5. CONFIGURATION JUMPER DETAILS

This section explains the use of several jumper options on the Aurora Baseboard.

| *Jumper Group Function* | *Silkscreen Label* | *Array Size* |
|---|---|---|
| LCD Panel Power Select (3.3V/5V) | JVLCD1 | 1 x 3 |
| LCD Backlight Brightness Control | JBKC1 | 2 x 2 |
| LCD Backlight Power ( 5V/12V) | JINV1 | 1 x 3 |
| LCD Scan Direction | JLCD1 | 2 x 2 |
| Serial Ports 3 and 4 RS-422/485 configuration | JCOM3, JCOM4 | 2 x 5 |
| CMOS RAM Reset / On-Board Backup Battery Disconnect | JBAT1 | 1 x 3 |

## 5.1 LCD Panel Power Select - 3.3V/5V (JVLCD1)

This jumper group must be configured according to input voltage required by the type of LCD panel that will be attached to Aurora's LCD panel interface connector.

| *Setting* | *LCD Panel Voltage* | |
|---|---|---|
| Short 1-2 | +5V |   |
| Short 2-3 | +3.3V (default) |   |

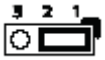
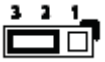
## 5.2 LCD Backlight Brightness Control (JBKC1)

This jumper group controls the LCD brightness selection.

| *Setting* | *Mode* | |
|---|---|---|
| Short 1-2 | Brightness set by chipset Backlight control | |
| Short 3-4 | Brightness set by Display Data Channel PWM (default) | |

## 5.3 LCD Backlight Power (JINV1)

This jumper group controls the LCD backlight inverter DC power selection.

| *Setting* | *LCD Panel Voltage* | |
|---|---|---|
| Short 1-2 | +5V (default) |  |
| Short 2-3 | +12V |  |

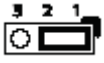
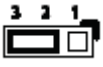
## 5.4 LCD Scan Direction (JLCD1)

This jumper group controls the LCD panel scan direction and frame rate control.

| *Setting* | *Mode* | |
|---|---|---|
| Short 1-2 | Reverse Scan Direction | |
| Short 3-4 | Forward Scan Direction (default) | |

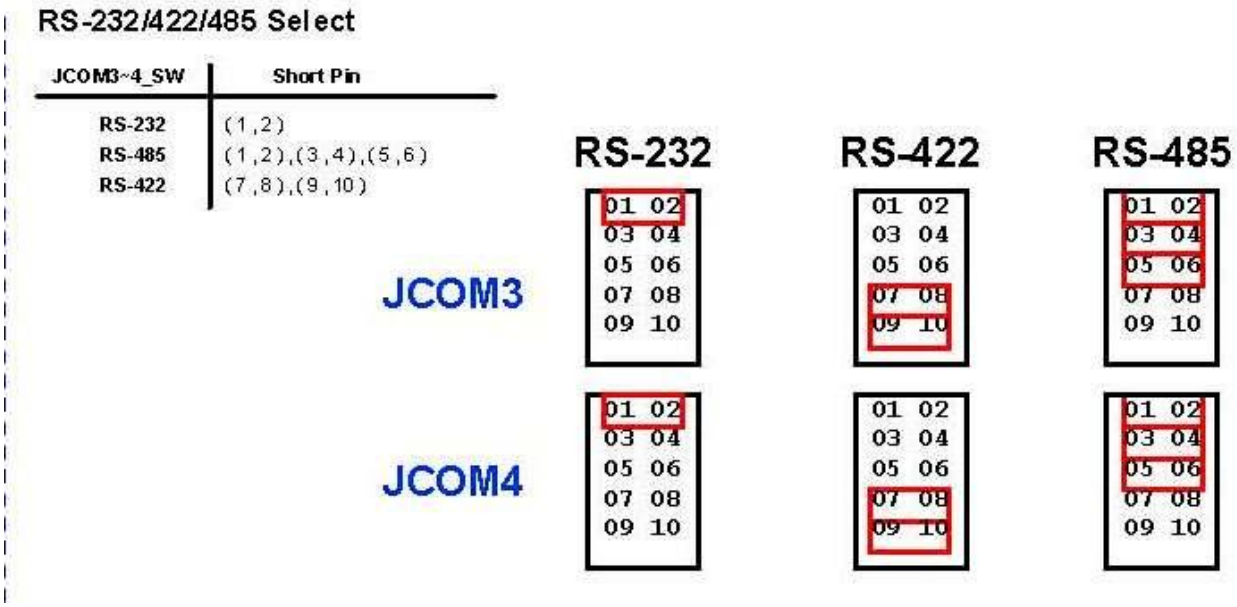
## 5.5 CMOS RAM Reset / On-board Backup Battery Disconnect (JBAT1)

This jumper group controls the external battery backup enable settings.

| *Setting* | *Mode* | |
|---|---|---|
| Short 1-2 | Backup battery connected (default) |  |
| Short 2-3 | Clear CMOS |  |

## 5.6 Serial Ports (JCOM3, JCOM4)

Following is the Aurora multi-protocol jumper selection for COM3 and COM4. Port COM3 is associated with jumper block JCOM3, and COM4 is associated with JCOM4.



# 6. BIOS

Aurora's BIOS provides access to many valuable features. These instructions show how to enter the BIOS, set up features, and restore the BIOS to its default settings.

## 6.1 Entering the BIOS

The BIOS may be entered during startup by pressing the **DEL** key on an attached keyboard or pressing **F4** if using console redirection. Press the key repeatedly right after power-on or reset until the BIOS screen appears.

After a certain amount of time during startup, the BIOS will ignore the DEL or F4 key. If you wait too long and the system does not respond, simply reset the system (or power down) and try again.

## 6.2 Restoring Default BIOS Settings

In order to load the default BIOS settings, turn off the system and install a jumper on pins 2-3 of jumper block JBAT1, located on the bottom right corner of the board. This will clear CMOS and reset the BIOS to the default settings. After three seconds put the jumper back to position 1-2 and turn the system on.

On the first screen after booting up, the user will be asked to press **F1** to run SETUP, or **F2** to load the defaults.

## 6.3 Setting the Date and Time

The date and time are set in the BIOS. Select **Main** menu, then enter the date and time at the bottom of the screen. This screen also displays the CPU speed and memory capacity of the board.

## 6.4 ISA Bus IRQ Reservation

An ISA bus IRQ must be reserved in the BIOS in order to be used by the on-board ISA bus circuits or an installed PC/104 module. To reserve an IRQ, go to the **PCIPnP** menu and scroll down to the IRQ list at the bottom. The default settings are IRQ15 reserved with the remaining IRQs available.

## 6.5 Boot Priority

To select Boot devices and set their priority, go to the **Boot -> Boot device priority** menu and select the first boot device from the list.

Upon clicking on the first boot device, a window with the available devices will open. The user can select any of the devices as the first boot device.

The devices can be a SATA HDD, a network drive, or a USB device.

The USB device present in this list is the first Drive defined in the "USB Drives" Menu.

Here are the steps to select a USB drive to boot from:

1. Boot-> USB Drives -> 1st Drive -> ( select a USB device from the list)
2. Boot->Boot Device Priority-> 1st Boot device ( select the USB device which has been defines in line 1)

In this way, the system will try to boot from the USB device. The same procedure applies for other boot devices (2nd, 3rd,…).

## 6.6 Chipset

The chipset menu is provided to define and change the North / South Bridge options such as Graphic Adapter Modes, flat panel type (default is 800x600), and enable/disable on-board PCI3 line and Ethernet adapter.

By default, both PCIe and LAN controllers are enabled. This can be changed in the South Bridge menu.

## 6.7 Super I/O Configuration

This is to set the address/IRQ of the four serial ports. COM3 and COM4 are capable of RS-232/422/485 protocols; whereas COM1 and COM2 can only be set to RS-232.

## 6.8 Console Redirection

In the advanced menu, the user can select any of the serial ports for console redirection with different speeds ranging from 115200bps to 9600bps as follows.

**Advanced - Remote Access Configuration** - Disabled (Default)

When set to Enabled, the console re-direction is activated on COM1 by default at 115200,n,8,1 communication settings. The remote access configuration can be enabled on any of the four COM ports. Baud rates supported are 115200 (default when enabled), 57600, 38400, 19200 and 9600.

When set to Enabled, the BIOS can be accessed by pressing F4 on the remote keyboard. BBS POPUP can be accessed by pressing F3 on that remote keyboard.

# 7. DIGITAL I/O LINES

Aurora has eight digital I/O lines found on connector GPIO_P1. This connector has one pin for each line plus an External Reset Input and Ground line. Please note that the digital I/O lines on Aurora are not 5V tolerant.

## 7.1 DIO Registers

Aurora's digital I/O lines are associated with a set of registers as shown in the following table.

| *Register* | *EC RAM* | *Read/Write* | *Description* |
|---|---|---|---|
| DIO_P0_DIR | 1658h | R/W | DIO port direction bits: |
| DIO_P1_DIR | 1659h | R/W | Output: 0x40 |
| DIO_P2_DIR | 165Ah | R/W | Input: 0x80 |
| DIO_P3_DIR | 165Bh | R/W | |
| DIO_P4_DIR | 165Ch | R/W | |
| DIO_P5_DIR | 1614h | R/W | |
| DIO_P6_DIR | 1615h | R/W | |
| DIO_P7_DIR | 1616h | R/W | |
| DIO_P0_LVL | 160Ah[bit0] | R/W | DIO level: |
| DIO_P1_LVL | 160Ah[bit1] | R/W | 1: High |
| DIO_P2_LVL | 160Ah[bit2] | R/W | 0: Low |
| DIO_P3_LVL | 160Ah[bit3] | R/W | |
| DIO_P4_LVL | 160Ah[bit4] | R/W | |
| DIO_P5_LVL | 1601h[bit4] | R/W | |
| DIO_P6_LVL | 1601h[bit5] | R/W | |
| DIO_P7_LVL | 1601h[bit6] | R/W | Note: Do not modify any other bits |

## 7.2 DIO Programming

To use Aurora's digital I/O lines, first configure the desired directions by writing the appropriate configuration value to the digital I/O lines' register. Then read or write data on the digital I/O lines' level register. All I/O lines are in read mode on power-up or after a board reset. Sample code for reading and writing to the digital I/O lines follows.

```
unsigned long Process_686C_Command_Write(ULONG m_ECCMD, ULONG m_ECDATA)
{
//-------------------------------------------------------------------------
Int         i,temp;
ULONG m_OutBuf;
//-------------------------------------------------------------------------
dscInp (  0x6C, &m_OutBuf );
if ( ( m_OutBuf&0x00000003) > 0 )
    {
          temp=Read_io_port(0x68);
          return 0xFFFFFFFF;
    }
```

```
dscOutp ( 0x6C, m_ECCMD );
for ( i=0; i<=4000; i++ )
{
    dscInp (  0x6C, &m_OutBuf );
    if ( ( m_OutBuf&0x00000002) == 0 ) break;
}
  if ( i < 3999 )
    {
          dscOutp ( 0x68, m_ECDATA );
          for ( i=0; i<=4000; i++ )
          {
            dscInp (  0x6C, &m_OutBuf );
            if ( ( m_OutBuf&0x00000002) == 0 )
                  { return 0x00000000; }
            }
    }

if ( i > 3999 ) dscInp (  0x68, &m_OutBuf );
return 0xFFFFFFFF;
}
//---------------------------------------------------------------------------


unsigned long Process_686C_Command_Read(ULONG m_ECCMD )
{
int i,temp;
   ULONG m_OutBuf,m_InBuf;
   dscInp (  0x6C, &m_OutBuf );
if ( ( m_OutBuf&0x00000003) > 0 )
          {
            temp=Read_io_port(0x68);
            return 0xFFFFFFFF;
          }
m_InBuf = m_ECCMD;
dscOutp ( 0x6C, m_InBuf );
for ( i=0; i<=3500; i++ )
{
    dscInp (  0x6C, &m_OutBuf );
    if ( ( m_OutBuf&0x00000001) > 0 )
    {
          temp=Read_io_port(0x68);
          temp= (temp & 0x000000FF ) ;
          return temp;
          break;
    }
}
if ( i > 3499 )
    {
    temp=Read_io_port(0x68);
    return 0xFFFFFFFF;
    }
}
//---------------------------------------------------------------------------
```

```
unsigned long ECU_Read_686C_RAM_BYTE( ULONG ECUMemAddr )
{
    ULONG uDATA1,uDATA2,ECRamAddrH,ECRamAddrL;
    ECRamAddrL=ECUMemAddr%256; ECRamAddrH=ECUMemAddr/256;
    //
    uDATA1=Process_686C_Command_Write(0x000000A3, ECRamAddrH );
    if ( uDATA1==0xFFFFFFFF ) { return 0xFFFFFFFF; }
    //
    uDATA1=Process_686C_Command_Write(0x000000A2, ECRamAddrL );
    if ( uDATA1==0xFFFFFFFF ) { return 0xFFFFFFFF; }
    //
    uDATA1=Process_686C_Command_Read( 0x000000A4 );
    if ( uDATA1 > 0x000000FF ) { return 0xFFFFFFFF; }
    uDATA2=Process_686C_Command_Read( 0x000000A4 );
    if ( uDATA2 > 0x000000FF ) { return 0xFFFFFFFF; }
    if (uDATA1==uDATA2) return uDATA1;
    else return 0xFFFFFFFF;
}
//---------------------------------------------------------------------------


unsigned long ECU_Write_686C_RAM_BYTE( ULONG ECUMemAddr,ULONG ECUMemData )
{
    ULONG uDATA, RD_DATA, ECRamAddrH, ECRamAddrL;
    ECRamAddrL=ECUMemAddr%256; ECRamAddrH=ECUMemAddr/256;
    //
    uDATA=Process_686C_Command_Write(0x000000A3, ECRamAddrH );
    if ( uDATA==0xFFFFFFFF ) { return 0xFFFFFFFF;}
    //
    uDATA=Process_686C_Command_Write(0x000000A2, ECRamAddrL );
    if ( uDATA==0xFFFFFFFF ) { return 0xFFFFFFFF;}
    //
    uDATA=Process_686C_Command_Write(0x000000A5, ECUMemData );
    if ( uDATA==0xFFFFFFFF ) { return 0xFFFFFFFF;}
    //
    return 0x00000000;
}
//---------------------------------------------------------------------------
```

# 8. WATCHDOG TIMER

One watchdog timer is provided for system control with a WDTOUT# signal. The base address for the watchdog timer is 0x300. The watchdog timer has a default hardware setting defined at power on which sets the timer to 10 seconds. The interval also can be programmed by registers for a 10ms, 1s or 1 minute timeout. Upon timeout, the timeout trigger pulls the tri-state signal, WDTOUT#, low.

## 8.1 Registers

**Timer Status and Control Register – Base + 0**

| *Bit* | *Register* | *Read/Write* | *Description* |
|---|---|---|---|
| 7:3 | Reserved | R/W | Return 0 when read |
| 2:1 | WDT_UNIT[1:0] | R/W | 00: timer unit is 10ms<br>01: timer unit is 1 second<br>10: timer unit is 1 minute<br>11: reserved |
| 0 | WDT_EVENT | R/W | Read<br>0: no time out occurred<br>1: time out has occurred<br>Write<br>0: no action<br>1: clear the time out status |

Power-on default [7:0] = 0x02 when DTR3#/PS_WDT is pulled-up, else 0x0.

**Timer Count Number Register – Base + 1**

| *Bit* | *Register* | *Read/Write* | *Description* |
|---|---|---|---|
| 7:0 | WDT_CNT[7:0] | R/W | Read: the current count of the watchdog timer<br>Write: the same value to enable the timer<br>0 to disable the timer |

Power-on default [7:0] = 0x0Ah when DTR3#/PS_WDT is pulled-up, else 0x00h.

## 8.2 Programming Sample Code

Following is sample code for programming Aurora's watchdog timer. The base address for the watchdog timer is 0x300.

```
/*                                                      */
/*      Fintek F81216D Watchdog Timer sample code */
/*                                                      */
/*-----   Include Header Area -----*/
#include "math.h"
#include "stdio.h"
#include "dos.h"

/*-----   routing, sub-routing -----*/
void main()
{

        printf(" i0158-Fintek F81216D WDT Utility Program Ver:0.2  \n");

        outportb(0x2e, 0x77);
        outportb(0x2e, 0x77); //Entry configuration mode

        outportb(0x2e, 0x07); //Select register index 0x07
        outportb(0x2f, 0x08); //Select LDN 8

        outportb(0x2e, 0x60); //Select LDN 8 register index 0x60
        outportb(0x2f, 0x03); //Set Watch Dog timer base address high byte to 0x03
        outportb(0x2e, 0x61); //Select LDN 8 register index 0x61
        outportb(0x2f, 0x00); //Set Watch Dog Timer base address low byte to 0x00

        outportb(0x2e, 0x30); //Select LDN 8 register index 0x30
        outportb(0x2f, 0x01); //Enable Watch Dog Timer Device

        outportb(0x2e, 0xaa); //Exit configuration mode

                                //Timer  Status and control Register - Base + 0
                                //bit 2:1 R/W           00:Timer Unit is 10 ms
                                //                              01:Timer Unit is 1 Second
                                //                              10:Timer Unite is 1 minute.
                                //                              11:reserved
                                //-------------------------------------------------
                                //bit 0         R/W             When read
                                //                              0:no time out occur.
                                //                              1:time out has occurred.
                                //                              When write
                                //                              0:no action
                                //                              1:clear time out status
        outportb(0x300, 0x03); //Select unit to one second and clear time out status

                                //Timer Count Number Register - Base + 1
                                //bit 7:0 R/W     Ther number of count for watchdog timer.
                // Write the same value to enable the timer, write 0 to disable timer.
        outportb(0x301, 0x05);
        outportb(0x301, 0x05); //Set timer to 5 second and enable timer


}
```

The demo code above is an example for DOS. The same demo code has been ported for Linux and Windows XP OS and can be downloaded from the Diamond Systems web-site at www.diamondsystems.com/products/aurora.

# 9. FLASHDISK MODULES

## 9.1 Overview

Aurora is designed to accommodate an optional wide-temperature solid-state USB flashdisk module for rugged mass storage in place of a notebook hard drive or commercial flashdisk. This module contains 1GB to 8GB of solid-state non-volatile memory that operates like any USB hard disk drive without requiring additional driver software support. It features automatic wear leveling and 1,000,000 write cycles minimum.

**USB Flashdisk**

## 9.2 Models and Capacities

| *Model* | *Capacity* |
|---|---|
| FDU-1G-XT | 1GB |
| FDU-2G-XT | 2GB |
| FDU-4G-XT | 4GB |
| FDU-8G-XT | 8GB |

## 9.3 Features

The flashdisk module works just like a USB disk drive and requires no drivers. It provides high-speed nonvolatile mass storage in capacities of 1GB to 8GB. The flashdisk mounts on connector USB3 and is held in place with a spacer and screw (included). It includes a write protection jumper and operates over -40ºC to +85ºC.

USB flashdisk features:

- USB 2.0 compatible interface
- Sustained read performance of 30MB/s
- Sustained write performance of 20MB/s
- Implements dynamic wear-leveling algorithms to substantially increase longevity
- BCH (6/12 bit) Error Detection Code/Error Correction Code (EDC/ECC0)
- Intrinsic data integrity after power loss
- Wear leveling algorithm provides more reliable data storage over time
- Write protection setting by jumper for prevention of data overwrites
- Supports boot function for Windows Embedded Standard, Windows Embedded CE, and Linux
- Low power consumption, typical 110mA when active and 0.45mA in sleep mode
- -40ºC to +85ºC operation
- RoHS compliant

An accessory cable, C-FDU-01, is available that connects the USB flashdisk to any USB port. This simplifies programming the flashdisk, or downloading data from it, by providing a direct connection between the flashdisk and a host PC.

## 9.4 Flashdisk Installation

Installing a USB flashdisk module on Aurora is straightforward using the following steps.

1. Ensure power is disconnected from Aurora.
2. Remove the screw from the standoff located between the flashdisk connector, USB3, and the PC/104 connector.
3. Align the flashdisk so that its female connector aligns with the pins on connector USB3 and the mounting hole aligns above the standoff.
4. Press the flashdisk downward onto connector USB3.
5. Reinstall the screw, securing the flashdisk module to Aurora.

# 10. RUGGEDIZED RSODIMM™ SO-DIMM MODULES

Aurora comes with ruggedized RSODIMM™ SO-DIMM SDRAM modules for improved performance in high shock and vibration environments. These modules securely affix to the Aurora single board computer through a pair of standoffs and screws. This innovative design ensures that the SO-DIMM module remains fixed in place and cannot back out of its socket.

These ruggedized SO-DIMM modules are identical in function to the standard SO-DIMMs, but have an extended PCB with two mounting holes that attach to Aurora as can be seen below.

**Ruggedized** RSODIMM™ **Module**

## 10.1 Models and Capacities

| *Model* | *Capacity* |
|---|---|
| MEM-1024R-05 | 1GB |
| MEM-2048R-05 | 2GB |

## 10.2 SO-DIMM Memory Installation

Installing a SO-DIMM memory module on Aurora is straightforward using the following steps. These steps assume you are installing a rugged memory SO-DIMM from Diamond Systems. If no, please disregard steps 2 and 6.

1. Ensure power is disconnected from Aurora.
2. Remove the two screws from the two standoffs located between the SO-DIMM connector and the edge of the board.
3. Insert the SO-DIMM module into the socket at a slight angle, approximately 30 degrees. The socket and module are both keyed, which means the module can be installed one way only.
4. To seat the module into the socket, apply firm, even pressure to each end of the module until you feel it slip down into the socket.
5. With the module properly seated in the socket, rotate the module downward. Continue pressing downward until the clips at each end of the socket lock into position.
6. Reinstall the two screws into the standoffs, securing the SO-DIMM to Aurora.

# 11. PANEL I/O BOARD

The Aurora panel I/O board, model PNL-AUR-01, provides a convenient way to access most of the SBC's I/O features without the use of cables. The bottom side contains 2mm female sockets that plug on top of the SBC and convert the SBC I/O pin headers to industry-standard connectors on the top side. Available I/O includes:

- 4 serial ports
- 4 USB ports
- VGA
- Ethernet
- PS/2 Keyboard & mouse

The panel I/O board may be used together with the Aurora SBC in an "open frame" configuration, or the assembly can be installed in a Pandora enclosure to create a complete, cable-free, compact industrial computer.

**Aurora Panel I/O Board, User Side**

**Aurora Panel I/O Board, SBC Side**

## 11.1 Mechanical Drawing

Figure 6 shows the panel I/O board connector layout. This drawing shows both the top side and bottom side connectors in one drawing to show the relative locations. The connectors located on the bottom of the panel I/O board are the five alternate power connectors at the bottom of the drawing below: JMM OUT (J2), JMM IN (J6), JMM IN (J5), REG5V (J3), and 12V/VIN (J4), from left to right looking from the top.

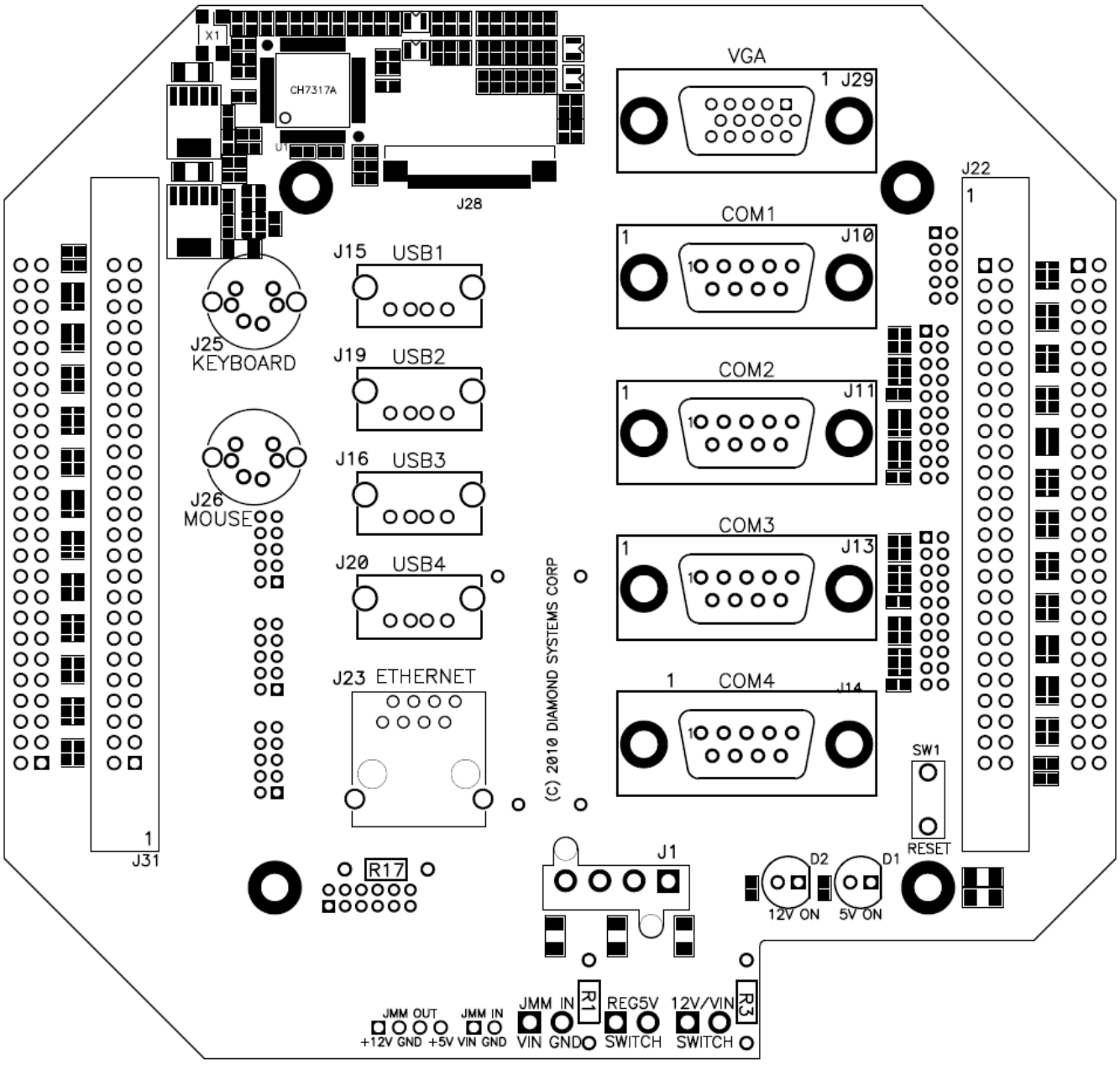



**Figure 6: Aurora Panel I/O Board Connectors**

## 11.2 Outside Facing I/O Connectors

These connectors are on the top side of the board. They face out through the enclosure front panel. All connectors must be compatible with the specified distance of 7mm between the top panel and the panel I/O board.

### 11.2.1 Input Power (J1)

The input power connector, J1, is Molex part number 39-30-2045 or equivalent. Each pin has a 6A or greater current carrying capacity.

Input power may be supplied either as +5VDC, +5V/+12V DC or as Vin. The +5V and +12V are intended to be switched directly to the PC/104 bus power pins via the external power switch. The Vin is intended to be switched to an auxiliary connector on the back side of the board which is used to connect to a DC/DC power supply. The output of the DC/DC power supply is then fed either to the PC/104 bus power pins (if the power supply is on the PC/104 bus) or back to the panel board and then to the Aurora SBC through the +5V pins on the SBC mating power input connector.

| | |
|---|---|
| 1 | +12V or Vin |
| 2 | Ground |
| 3 | Ground |
| 4 | +5V In |

### 11.2.2 Ethernet (J23 Ethernet)

The Ethernet connector, J23, is a vertical metal-shielded RJ-45 jack with industry standard pinout for gigabit Ethernet.

Proper isolation must be maintained on all Ethernet signal routing to meet industry standard signal isolation specifications. No ground or power plane should be above or underneath these signals.

### 11.2.3 VGA (VGA)

The VGA connector is standard vertical DD15 female connector with industry standard VGA pinout. It has 4-40 thread inserts and hex screwlocks. The signals come from the SBC mating VGA connector.

### 11.2.4 USB (USB1, USB2, USB3, USB4)

The USB connectors are four vertical metal shrouded type A connectors with industry standard pinout for USB. The signals come from the two SBC mating USB connectors.

### 11.2.5 PS/2 Keyboard and Mouse (J25 Keyboard, J26 Mouse)

The PS/2 connectors are two vertical Mini-DIN-6 connectors with industry standard pinout for PS/2 keyboard and mouse. The signals come from the SBC mating PS/2 connector.

### 11.2.6 Serial Ports (COM1, COM2, COM3, COM4)

The serial port connectors are four vertical DB9 male connectors. They have 4-40 thread inserts and hex screwlocks. Ports 1-4 signals come from the two 20-pin SBC serial port connectors and each port connector uses the pinout shown below. To prevent EMI problems, ferrite bead packs are installed on the panel I/O board on the signal and ground connections to the DB9 connectors.

| DB9 Pin | RS-485 Signal Name | RS-422 Signal Name | RS-232 Signal Name | Serial Port Connector | | RS-232 Signal Name | RS-422 Signal Name | RS-485 Signal Name | DB9 Pin |
|---|---|---|---|---|---|---|---|---|---|
| 1 | NC | NC | DCD | 1 | 2 | DSR | RXD- | NC | 6 |
| 2 | NC | RXD+ | RXD | 3 | 4 | RTS | TXD- | TXD/RXD- | 7 |
| 3 | TXD/RXD+ | TXD+ | TXD | 5 | 6 | CTS | NC | NC | 8 |
| 4 | NC | NC | DTR | 7 | 8 | RI | NC | NC | 9 |
| 5 | GND | GND | GND | 9 | 10 | NC | NC | NC | |

## 11.3 Power Routing

There are two paths for input power. A +5VDC source, a +5V/12V source, or a variable input voltage source can be connected to the Aurora SBC power connector, or it can be connected to an external power supply source that provides +5V and +12V power to the PC/104 bus in the stack.

The panel I/O board also provides a path for optional +12VDC output from a power supply to the Aurora SBC through the pin socket.

The panel I/O board contains two green LEDs which are connected to the +5VDC and +12V/VIN signals to indicate power status.

There is also a 3.5V lithium battery mounted on the board to provide standby voltage to the CMOS/RTC unit on Aurora. The battery is a LTC-7PN or equivalent type with 4 pins and is soldered on the panel board without a socket for rugged-environment applications.

The schematic in Figure 7 indicates the power routing between the input power connector and Aurora through the panel I/O board. Power may be provided in several methods:

1. +5V (and +12V) in from the input power connector directly to the panel I/O board, using either the front panel switch or a direct connection, and then to the Aurora SBC through the input connector (PWR1).
2. Vin (+8-30VDC) from the input power connector to a connector leading to an internal DC/DC power supply, whose output is driven directly onto the PC/104 bus using the PC/104 bus connectors on the DC/DC power supply. The Vin may be routed to the power supply connector either through the front panel switch or through a direct connection.

The +5V source is connected to the board by a 1x4 0.200” locking connector, routed through a 1x2 0.156” pitch friction lock connector for a front panel switch and then to a pin socket on the bottom side that mates with Aurora. If +12V is also needed it is connected to the board by the same 1x4 connector, routed through a separate 1x2 0.156” friction lock connector for a front panel switch and then to the same pin socket on the bottom side that mates with Aurora. In this case the switch would be DPDT type instead of the SPDT type used by 5V or 12V only. The switch connectors can be bypassed with jumpers if desired.

The variable input voltage source is routed through another 1x2 .1” pitch friction lock connector for a front panel switch and then to a separate 1x2 0.156” pitch or 1x2 0.100” pitch friction lock connector for connection to a DC/DC power supply mounted inside the enclosure. The +5VDC output of this DC/DC power supply then has two paths to Aurora: (1) It can connect directly to the PC/104 bus of the system, if the power supply is mounted on the bus; or (2) it can be routed back to the panel I/O board with another connector and then to Aurora through the panel I/O board’s pin socket connection.

The switch bypass jumpers are 0-ohm ¼ watt T/H resistors. To use the panel power switch, the resistor is cut away, opening the circuit.

The +12 input option jumper is used to enable +12V to be supplied through the Vin pin on the front panel connector. In this case both +5V and +12V would be supplied through the front panel connector. This jumper is a 0-ohm ¼ watt T/H resistor.

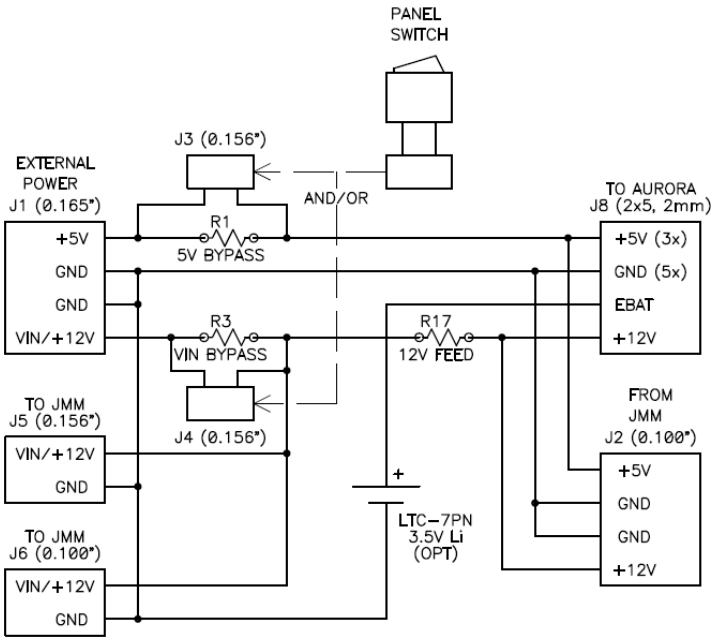



**Figure 7: Power Routing Schematic**

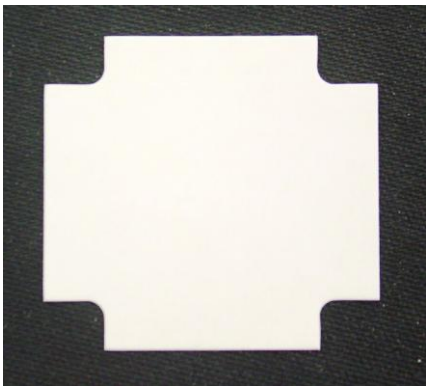
# 12. THERMAL PAD

A thermal pad is included with every Aurora. It is the same size as the heatspreader and attaches to the bottom of the heatspreader, but is shipped loose with the product. Customers can choose to affix the thermal pad or not depending on their needs. The specifications for the thermal pad are as follows.

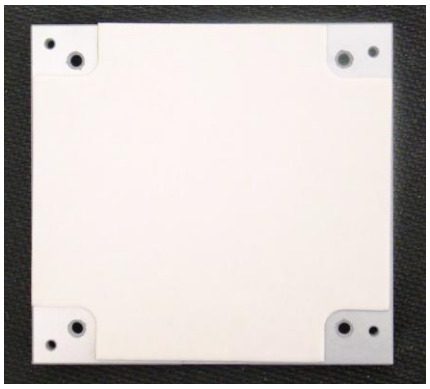
- Material: 3M 5590H
- Color: Light Grey
- Thickness: 0.5/1.0 mm
- Thermal Conductivity: 3.0 W/m-K

To affix the thermal pad:

- Remove the clear plastic film from the adhesive side of thermal pad
- Align the thermal pad above the heatspreader so all four edges are flush with the heatspreader edges and the adhesive side is facing the heatspreader
- Press to attach as shown in the photo below



Thermal pad



Thermal pad on heatspreader

# 13. SPECIFICATIONS

- Processor: Intel Atom Z530P at 1.6GHz or Z510 at 1.1GHz
- Front side bus speed: 533MHz
- Cooling : Heatspreader, fanless
- Memory: Up to 2GB ruggedized RSODIMM™ DDR2 DRAM
- Display options:
  - LVDS flat panel interface
  - SDVO (optional VGA adapter)
- LVDS backlight power: +5V or +12V jumper selectable
- USB ports: 4 USB 2.0
- Serial ports: 2 RS-232/422/485, 2 RS-232
- Networking: 1 Gigabit Ethernet – Intel 82574IT
- Mass storage:
  - 1 SATA port
  - Support for USB flashdisk
- Keyboard/Mouse PS/2, with BIOS support for USB
- Digital I/O: 8 digital I/O
- Watchdog Timer Yes
- PCI Express: 1 PCIe x1 lane to SUMIT-A bus
- Expansion buses: SUMIT-A stackable, PC/104 (ISA) stackable
- Input power: 5V ±5%
- Power consumption: 5.4W
- Operating temperature : -40°C to +80°C (-40°F to +176°F) at headspreader surface
- MTBF: 211,720 hours (Aurora Z530 models)
- Shock:

  MIL-STD-202G Table 213-1 J

  Half-Sine Wave Shock

  30 G, 11ms: 3 time shocks at both directions per axis: Vertical / Transverse / Longitudinal
- Vibration

  MIL-STD-202G Method 204, Modified Condition I A

  Random Vibration

  Axes: Vertical / Transverse / Longitudinal

  20-2000Hz: 20-100Hz at 6dB/octave, 100-1000Hz at 0.04$G^2$/Hz,

  1000-2000Hz at -6dB/octave

  Sine Sweep Vibration

  Axes: Vertical / Transverse / Longitudinal

  10-2000Hz: 10-57Hz at 0.6", 57-2000Hz at 10G, sweep rate 20 minutes per cycle
- Dimensions: 3.55" x 3.775" x 0.9” (90mm x 96mm x 23mm)
- Weight:7.5oz / 212g